

CLAIMS

What is claimed is:

1. A device for manipulating particles using dielectrophoresis, the device comprising:
 - a substrate;
 - an insulating ridge on the substrate;
 - a plurality of electrodes positioned to generate a spatially non-uniform electric field across the insulating ridge.
2. A device according to claim 1, further comprising a plurality of the insulating ridges.

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3. A device according to claim 1, wherein the substrate comprises glass.
4. A device according to claim 1, wherein the substrate comprises a polymer.
5. A device according to claim 1, wherein the insulating ridges comprise an insulating material supported by a non-insulating material.
6. A device according to claim 1, further comprising a voltage source connected to the plurality of electrodes.
7. A device according to claim 1, wherein the plurality of ridges on the substrate define a surface of a first fluid channel.
8. A device according to claim 7, further comprising a fluid port connected to the first channel.
9. A device according to claim 8, further comprising a second fluid channel connected to the first fluid channel.

9¹⁰ A device according to claim 1, wherein the plurality of ridges are each at an angle of between 20 and 80 degrees relative to a direction of fluid flow.

10¹¹ A device according to claim 1, wherein the plurality of ridges are each at an angle of about 45 degrees relative to a direction of fluid flow.

11¹² A device according to claim 1, wherein the plurality of ridges includes a first ridge and a second ridge, said first and second ridges being positioned at different angles relative to a direction of fluid flow.

12¹³ A device according to claim 1, wherein at least one ridge of the plurality of ridges is curved toward a concentration area.

13¹⁴ A device according to claim 1, wherein the plurality of ridges are curved toward a concentration area.

14¹⁵ A device according to claim 1, further comprising:
a plurality of impedance matching ridges substantially parallel to the direction of fluid flow.

15¹⁶ A device according to claim 1, further comprising:
a plurality of impedance matching ridges substantially parallel to a direction of fluid flow.

16¹⁷ A device according to claim 1, wherein the spatially non-uniform electric field generated across the ridges exerts a dielectrophoretic force on at least one of said particles.

17¹⁸ A device according to claim 1, wherein said particles comprise particles selected from the group of particles consisting of bacteria, cells, and viruses.

18¹⁹ A method for manipulating particles using dielectrophoresis, the method comprising:

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generating a spatially non-uniform electric field across an insulating ridge; passing a sample fluid containing the particles across the insulating ridge, the spatially non-uniform electric field exerting a dielectrophoretic force on the particles thereby constraining motion of at least one particle; and transporting at least the constrained particle along the ridge.

²⁶ 19. A method according to claim ¹⁸, wherein the act of transporting the particle comprises electrokinetic transport.

²⁷ 19. A method according to claim ¹⁸, wherein the act of transporting the particle comprises advection.

²⁸ 19. A method according to claim ¹⁸, wherein the act of transporting the particle comprises transporting particles using a gravitational force.

²⁹ 19. A method according to claim ¹⁸, wherein the act of contacting the insulating ridge with a sample fluid comprises flowing the sample fluid across the insulating ridge.

³⁰ 19. A method according to claim ²², wherein the insulating ridges are positioned at an angle with respect to the direction of fluid flow.

³¹ 19. A method according to claim ¹⁸, further comprising transporting the particles to a concentration area.

³² 19. A method according to claim ¹⁸, further comprising:
generating a spatially non-uniform electric field across a plurality of insulating ridges including a first ridge and a second ridge, thereby constraining motion of at least a first particle to a region adjacent the first ridge;

changing the spatially non-uniform electric field such that the dielectrophoretic force on the first particle is decreased; and

transporting the first particle to the second ridge.

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